CLAIMS

1. A method for manufacturing a belt structure of a green tire for vehicles comprising the steps of:

a) preparing, in a substantially continuous manner, a belt assembly (39) incorporating reinforcing cords (10) substantially parallel to one another and inclined of a predetermined angle (α) with respect to the longitudinal axis (1-1) of the belt assembly (39);

b) cutting, in a substantially continuous manner, said belt assembly (39) along a cutting direction substantially parallel to said axis (1-1), so as to obtain two substantially continuous belt strips (19a, 19b) extending along two conveying directions (Y-Y, Z-Z) substantially parallel to one another;

c) supplying, in a substantially continuous manner, said belt strips (19a, 19b) to at least one assembly drum (50, 51);

d) superposing on said at least one assembly drum (50, 51) portions (49a, 49b) having a predetermined length of each of said belt strips (19a, 19b), so as to obtain a belt structure comprising radially superposed portions (49a, 49b) of belt strips (19a, 19b) wherein said reinforcing cords (10) are parallel to one another in each portion (49a, 49b) and inclined in opposite direction with respect to the cords (10) of the adjacent portion (49a, 49b).

2. Method according to claim 1, wherein said belt assembly (39) is prepared by means of the steps of:

e) forming, in a substantially continuous manner, a sheet (9) of rubber-coated fabric incorporating a plurality of reinforcing cords (10) substantially parallel to one another;

f) transporting said sheet (9) along a predetermined conveying direction (X-X);

g) cutting said sheet (9) of rubber-coated fabric along a cutting direction forming a predetermined cutting angle (β) with respect to the conveying direction (X-X) of the sheet (9) of rubber-coated fabric, so as to obtain a plurality of strips (18) of predetermined prevailing length;

h) rotating each strip (18) of an angle equal to said inclination angle (α) of the reinforcing cords (10) with respect to the direction (X-X);

i) splicing said rotated strips (18) at an edge of prevailing length thereof.

3. Method according to claim 1, wherein said step d) is carried out by means of the steps of:

l) cutting a portion (49a) of a first belt strip (19a) having a length substantially equal to the circumferential development of the assembly drum (50, 51);

m) applying said portion (49a) of the first belt strip (19a) on a first (50) of two assembly drums (50, 51) coaxially aligned along a substantially horizontal rotation axis (A-A), said assembly drums (50, 51) being fixed on diametrically opposite sides of a device (52) for supporting and angularly positioning the assembly drums (50, 51);

n) rotating of 180° the device (52) for supporting and angularly positioning said assembly drums (50, 51) about an axis (R-R) perpendicular to said rotation axis (A-A), thereby switching said drums (50, 51) with one another;

o) cutting a portion (49b) of the second belt strip (19b) having a length substantially equal to the circumferential development of the portion (49a) of the first belt strip (19a) wound around the assembly drum (50, 51);

p) applying said portion (49b) of the second belt strip (19b) on the portion (49a) of the first belt strip (19a) wound around said first assembly drum (50), so as to obtain the belt structure;

q) applying said portion (49a) of the first belt strip (19a) on the second assembly drum (51);

r) cyclically repeating said steps m)-q) on each of said assembly drums (50, 51).

4. Method according to claim 1, comprising the additional step of discarding one of said portions (49c) of belt strips (19a, 19b).

5. Method according to claim 1, wherein said portions (49a, 49b) of belt strips (19a, 19b) are obtained on respective conveying means (43, 44) for conveying the belt strips (19a, 19b) and the portions (49a, 49b) of the belt strips provided along said conveying directions (Y-Y, Z-Z).

6. Method according to claim 5, wherein said belt strips (19a, 19b) are supplied to said at least one assembly drum (50, 51) by means of said conveying means (43, 44) for conveying the belt strips (19a, 19b) and the portions (49a, 49b) of belt strips.

7. A plant for manufacturing a belt structure of a green tire for vehicles comprising:

a) an extrusion apparatus (8) for forming, in a substantially continuous manner, a sheet (9) of rubber-coated fabric incorporating a plurality of reinforcing cords (10) substantially parallel to one another;

b) conveying means (15) for conveying said sheet (9) of rubber-coated fabric along a first conveying direction (X-X);

c) a first cutting device (17) for cutting said sheet (9) of rubber-coated fabric in a first cutting position (F) along a cutting direction forming a predetermined cutting angle (β) with respect to said first conveying direction (X-X), so as to obtain a plurality of strips (18) of predetermined length;

d) a strips transfer device (16) for transferring said strips (18) from said cutting position (F) to a releasing position (B) at which the strips (18) are arranged parallel to one another along the edge of prevailing length thereof;

e) a splicing device (38) for splicing said strips (18) at their edges of prevailing length so as to form a substantially continuous belt assembly (39) incorporating reinforcing cords (10) parallel to one another and inclined of a predetermined angle (α) with respect to the longitudinal axis (1-1) of the belt assembly (39);

f) conveying means (26) for conveying the strips (18) and the belt assembly (39) along a second conveying direction;

g) a second cutting device (42) for cutting said belt assembly (39) along said longitudinal axis (1-1) in two belt strips (19a, 19b);

h) a third cutting device (47, 48) for cutting each belt strip (19a, 19b) in portions (49a, 49b) of predetermined length;

i) conveying means (43, 44) for conveying said belt strips (19a, 19b) and said portions (49a, 49b) of belt strips (19a, 19b) along respective conveying directions (Y-Y, Z-Z);

l) at least one assembly drum (50, 51) adapted to support said portions (49a, 49b) of belt

strips (19a, 19b).

8. Plant according to claim 7, further comprising a pickup device (54) for picking up and intermittently discarding one of said portions (49c) of belt strips (19a, 19b).

9. Plant according to claim 7, wherein said extrusion apparatus (8) comprises an extrusion head (12) for supplying in a substantially continuous manner a sheet (9) of rubber-coated fabric incorporating a plurality of reinforcing cords (10) on said conveying means (15) for conveying said sheet (9) of rubber-coated fabric, said plurality of reinforcing cords (10) being supplied by a creel (11) supported upstream of said extrusion head (12).

10. Plant according to claim 7, wherein said strips transfer device (16) comprises:

m) means (21) for moving said strips (18) away from said cutting position (F) and placing each of the strips (18) in a pickup position (A) away from said first conveying direction (X-X);

n) at least one positioning device (25) of the strips (18) for picking up each one of said strips (18) from said pickup position (A) and placing each of the strips (18) in said releasing position (B) onto said conveying means (26) for conveying the strips (18) and the belt assembly.

11. Plant according to claim 10, wherein said means (21) for moving away the strips (18) comprises said conveying means (24) for conveying the strips (18) having a conveying axis (N-N) substantially parallel to the cutting direction of the sheet (9) of rubber-coated fabric, said conveying means (24) of the strips (18) being movable between a receiving position (E) of the strips (18) arranged downstream of the first cutting device (17) of the sheet (9) of rubber-coated fabric and said pickup position (A).

12. Plant according to claim 10 or 11, further comprising a catching device (22) for catching the sheet (9) of rubber-coated fabric active on said sheet (9) so as to transport the free end thereof past said first cutting device (17), said catching device (22) for catching the sheet (9) of rubber-coated fabric cooperating with said transporting device (16) of the strips (18).

13. Plant according to claim 10, wherein said at least one positioning device (25) of the strips (18) comprises a catching device (27) for catching said strips (18), said catching device (27) for catching the strips (18) being rotatably mounted about an axis

perpendicular to the strip (18) on a supporting frame (28) movably driven to and from said conveying means (24) of the strips (18).

14. A method for manufacturing a belt package of a green tire for vehicles comprising the steps of:

a) preparing a belt structure on a first assembly drum (50) by means of a method according to any one of claims 1 to 6;

b) transferring said belt structure onto a third assembly drum (66);

c) coaxially forming on the belt structure supported by the third assembly drum (66) a layer of circumferentially oriented reinforcing cords (5), said layer having a maximum length and a maximum width substantially equal to those of the belt structure.

15. Method according to claim 14, wherein said layer of cords is formed by applying on the belt structure a ribbon of rubber mixture having a predetermined width, said ribbon being coextruded in a substantially continuous manner together with a plurality of cords (5) prealigned along a direction parallel to the extrusion direction of the ribbon.

16. Method according to claim 14, wherein said layer is formed by spirally winding on the belt strip at least one tape (4) of rubber-coated fabric incorporating one or more reinforcing cords (5).

17. A plant for manufacturing a belt package of a green tire for vehicles comprising:

a) a plant (2) for manufacturing a belt structure according to any one of claims 7 to 13;

b) an extrusion apparatus (67) for forming, in a substantially continuous manner, a ribbon or tape (4) of rubber mixture incorporating a plurality of reinforcing cords (5) substantially parallel to one another;

c) cutting means for cutting said ribbon or tape (4) of rubber mixture in portions of predetermined length;

d) an assembly drum (66);

e) a transfer device (65) for transferring said belt structure towards said assembly drum (66).

18. Plant according to claim 17, wherein said extrusion apparatus (67) for forming in a substantially continuous manner said ribbon or tape (4) of rubber mixture comprises an extrusion head (71).

19. A method for manufacturing a crown structure of a green tire for vehicles comprising the steps of:

a) preparing a belt package on an assembly drum (50, 51) by means of a method according to any one of claims 14 to 16;

b) providing, in a substantially continuous manner, a plurality of treads (7) by cutting a substantially continuous tread sheet (74) of rubber mixture in portions of predetermined length;

c) coaxially applying said treads (7) on the belt package.

20. Method according to claim 19, wherein said tread (7) is formed by extrusion in a substantially continuous manner.

21. A plant for manufacturing a crown structure of a green tire for vehicles comprising:

a) a plant for manufacturing a belt package according to any one of claims 17-18;

b) an extrusion apparatus (73) for forming, in a substantially continuous manner, a continuous tread sheet (74) of rubber mixture;

c) conveying means (75) for conveying said continuous tread sheet (74) of rubber mixture towards an assembly drum (66) on which said belt package is supported;

d) cutting means for cutting said continuous tread sheet (74) of rubber mixture in portions of predetermined length, so as to obtain respective treads (7).

22. Plant according to claim 21, wherein said conveying means (75) for conveying said continuous tread sheet (74) of rubber mixture is equipped with cooling means.